

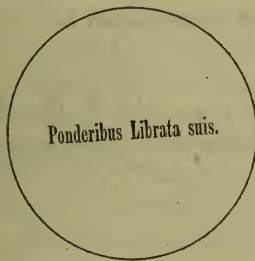
6

PRINCIPLES AND RUDIMENTS
OF
MINERALOGY, BOTANY, ZOOLOGY.

By C. R. W. WATKINS,

GENTLEMAN, LATE CAPTAIN IN THE BOMBAY ARMY, AND NEPHEW OF
A LATE DIRECTOR OF THE HONOURABLE EAST INDIA COMPANY.

*Published during the Fourth Century of the Modern Commercial Age and Era,
during the Roman or Julian Month July.*



LONDON:

ROBERT HARDWICKE, 26, DUKE STREET, PICCADILLY.

1855.

Dedication.

TO THE
PEOPLE, TRIBES, AND FAMILIES

OF SCYTHO-ASSYRIAN—OF ASI-ASSYRIAN—OF SINITE—
OF SCYTHO-SINITE—OF AFR-ASIAN—OF ASI-SARMATIAN—
OF AUSTRAL-ASIAN—AND OF POLYNESIAN RACE,

TO THEIR

BRAHMUNS, PRIESTS, AND INSTRUCTORS,

This Work is Dedicated by

C. R. W. WATKINS,

*Gentleman, Late Captain in the Bombay Army, and Nephew of
Late Director of the Hon. E. I. Company.*

PRINCIPLES AND RUDIMENTS
OF
MINERALOGY, BOTANY, ZOOLOGY.

CHAPTER I.

*Of the Phenomena and Structure of the Terraqueous
Globe and Planet.*

AXIOMS OF MINERALOGY AND PHILOSOPHY.

PHILOSOPHY informs us that the Terraqueous Globe and Planet, inhabited by mankind, is constructed of Atoms, or infinitely small particles of Earth and Water. Considered Naturally, as a Chaotic, or an Orbicular body of Creation, the terraqueous Planet is congested and formed of visible substance, Material and Fluid. Considered and examined according to the science of Experimental Philosophy and the doctrine of reality, the terraqueous globe and planet consists of four Elements, viz.: Earth, Water, Fire, Air: that is to say, one Material element, Earth; one Fluid element, Water; one Immaterial element, Air; one Transmuting and Converting element, Fire. All natural products, created and composed of these four elements of the terraqueous globe and Planet, are resolved and divided by the science of Philosophy into Mineral, Vegetative, and Animate products.

Mineralogy treats of the structure and of the Mineral

products of the terraqueous globe and planet, that is to say, of Material substance and body, without Vitality; otherwise the Mineral kingdom, or the Mineral state of nature.

Botany is a description of the Vegetative products of the terraqueous globe and planet, that is to say, of Nature in a state of sexual vitality and increase; otherwise the Vegetable kingdom, or the Vegetative state of nature.

Zoology treats of the Animate products of the terraqueous globe and planet, that is to say, of the Animate and migrational state of nature; otherwise the Animal kingdom.

The Primeval Ethereal Essences of the Universe, conceived by Terrene Nature, during the gyration of the terraqueous globe and planet around the Sun, or great solar orb, are—

Order	} The opposite and Passive Virtues are	Chaos.
Light		Darkness.
Motion		Rest.
Heat		Cold.
Vibration		Sound.
Gravitation		Circumference.
Attraction		Repulsion.

The science of Philosophy, or true knowledge, commences, therefore, with the Principle, Principium, or Primary maxim, that “terrene nature,” pervading all natural substances and bodies of the terraqueous globe and planet, is endued with an active and passive, a male and female, also an animate and locomotive instinct and existence; that is to say, *mineral products* (or *minerals*) have a passive increase and decay, or diminution of material substance and mineral consistency; also of weight, or gravity.

Vegetative Products (or *Plants*) have a material and fluid increase or growth, also a Vitality, or vital function of sex and propagation.

Animate Products (or Animals) are male and female, they are endowed with the Breath of Life, Sensation, and mechanical power, and they also have locomotive functions, or faculties.

All substances and bodies of the terraqueous globe and planet are discriminated and distinguished by the several mathematical, chymical, or mechanical properties of the constitutive parts and portions of their structure.

The different forms, structure, essential and constituent parts, portions, functions, or faculties, diversities, and changes distinguishing all substances and bodies of Terrene Nature, during their creation, preservation, and destruction, continue from generation unto generation, according to the several laws imparted by the Almighty Creator to each kind of thing, or creature, proportionally to their predestined use in the System of the Universe.

CHAPTER II.

Of the Elements of the Terraqueous Globe and Planet.

THE planet we inhabit, considered philosophically and mathematically as to its form, structure, essential and constitutive parts, or portions, is an orbicular body, sphere, or globe, consisting of visible substance, or of the material and fluid particles of earth and water.

I.—*Of the Fluid Element of the Terraqueous Globe and Planet, or Aqueous and Fluid Substance—Water.*

MATHEMATICAL AXIOMS.

Water—or the great collection of waters, called the Ocean—extends in one vast and undivided expanse occupying more than two-thirds of the surface and circumference of the terraqueous globe.

The Ocean, throughout its aqueous extent and fluid sub-

stance is everywhere salt, or saline; and in many parts unfathomable. But the quantity and proportion of its waters remain always the same. For although the rivers flow unceasingly into the Ocean, and water is at all times found beneath the surface of the land, any excess is prevented by Evaporation; because, and in consequence of the expansive power of the Sun, or solar orb, and the motion of heat, a Vapour of atomic particles is exhaled from every part of the surface and superficies of the Terraqueous Globe.

By means of the continual motion of heat, and the process of exhalation, the terraqueous globe and planet we inhabit is everywhere surrounded to a certain distance from its periphery by the expanse and element of air called its Atmosphere. The concentric pressure of the circumambient atmosphere upon the superficies and surface of the terraqueous planet preserves its mineral consistency and orbiculate form as a sphere, globe, or round body; and also prevents the waters of the Ocean from separating and dispersing; For, the constitutive particles of the Vapour being all equal particles of the same fluid substance, they ascend, and circulate in equal quantities and spaces; but as they diverge and gravitate at equal radii from the terraqueous planet's centre of rotary and planetary motion, the Ocean, or aqueous portion of the terraqueous globe and planet displays a plain or level surface.

In like manner the Terraqueous Planet, and other Planetary Bodies of Creation revolving through the realms of space, are separate parts, or portions of a Solar system; and they are preserved in continual motion, each in their respective orbits and planetary revolutions around the Sun, or great solar orb and Planet, as well as around their own polar diameters, by means of the motive force, or power of Solar vibration, heat, and gravitation, divergent from and exerted from a common centre of Motion.

Mathematically considered, Order, succession, and harmony, are thereby maintained in the System of the Universe.

II.—*Of the Atmosphere and Immaterial Element of the Terraqueous Globe and Planet.*

AXIOMS OF CHYMISTRY.

Air is invisible, elastical, incorporeal, and is the medium of Vitality to every Vegetative product, or plant existing, as well as the medium of respiration to every Animate product, or animal endowed with the breath of Life.

The Vapour continually arising from, and enveloping the terraqueous globe and planet, also flowing around its periphery; and being its Atmosphere, and Immaterial Element, has been denominated by Philosophers, Gas, or spirit not capable of coagulation.

Chymical experiments show that certain quantities of Gas, of an acid, inflammable, and watery nature, flow, and are always present and commingled in the same invariable proportions throughout the expanse of the Atmosphere of the terraqueous globe and planet.

The essential properties of the Gas, or Vapour of atomical particles commingled in the atmosphere, have been discriminated as oxygen gas, nitrogen gas, hydrogen gas, and carbonic acid: in fact, those philosophical experiments prove that the Atmosphere we breathe, is of an elementary nature, and partakes of earth, water, and fire.

The Atmosphere becomes hot, or cold, humid, or dry, elastic, or condensed; according as the watery particles, either remain suspended in the atmosphere as clouds and fog, or otherwise fall upon the surface, or superficies of the terraqueous globe and planet, as dew, frost, rain, hail, snow, sleet; also according to the migration and aspect of the Sun, or great

solar orb and planet, north, or south of the Equator; as well as according to the time and season of the year.

The varying state of the Atmosphere is indicated and measured by a scale of degrees marked on thermometers and barometers.

III.—*Of the transmuting, or converting Element—Fire.*

Fire is an element expansive, and multiplying.

Experimental Philosophy shows that the motive force and power of Fire is the mechanical and operative cause of motion and change to substances and bodies of the terraqueous globe and planet.

Fire is accompanied with heat and light; and all substances and bodies of Terrene Nature, when subjected to Igneous and Vulkanoan combustion, or action, undergo a change apparent to the sight, or sensible to the touch. The element Fire is latent as heat throughout the terraqueous globe, and has a transmuting, or converting power; for Ice, and other substances, are melted by heat: Ice, then becomes fluid (water), and other substances become liquid. The water, as well as the liquid substances, if boiled, are converted into vapour, or steam, and mingle with the atmosphere. Inflammable substances (as vegetable and animal substances) are consumed by Fire, and reduced to powder, or calcined; and if the calx, or ashes of vegetable substance be mixed with sand, or arenaceous earth, and subjected to the intense heat and mechanical action of Fire; a chymical combination of the two material terrene substances, or mineral earths, takes place, and the amalgam, or mixed mineral product, becomes glass.

Water beneath the surface is warmer than the exterior waters of the planetary globe; and Philosophers who have discovered numerous hot fountains and streams of mineral, and

other waters issuing from different parts of the material, or mineral substance of the superfcies of the terraqueous globe and planet, are of opinion that the interior heat increases intensely from the surface and circumference of the planetary globe, or sphere, to its centre, and according to a certain mathematical ratio.

The exceeding force and motive power of the Igneous Element is apparent during earthquakes and the eruption of Volcanoes; nor does it surpass belief that the mechanical action of Fire, and the quantity of heat, may become so intense and multiplied as to destroy the terraqueous globe and planet.

Metals are melted, and the hardest precious stones are consumed by Fire.

IV.—*Of the Material Element of the Terraqueous Globe and Planet, or Material and Mineral Substance—Earth.*

AXIOMS OF NATURAL PHILOSOPHY AND MINERALOGY.

The terrene portion of the terraqueous globe (and planet), that is to say, the entire mass of its Material substance and superfcies, considered and described in a scientific, systematic, and comprehensive manner, is denominated Mineral, the Mineral kingdom, or the Mineral state of nature.

The constituent parts of the Visible Material substance of the terraqueous Globe and Planet (existing as the bases of the Mineral kingdom) are chiefly sand, or arenaceous earth, clay, or argillaceous earth, mud, and humus (the silt, or small particles of decayed plants and animals), gravel, chalk, also limestone, slatestone, granite, basalt, and other concrete stone, as well as metals and metallic earths.

These constituent parts of Material terrene substance (other-

wise primordial mineral bases), although extending irregularly and without form, are frequently observed to be separated, or divided into several distinct strata, that is to say, beds, or layers of Material Mineral substance, placed in Order, or mathematical and numerical series, and apparently deposited at different times, or periods of time ; for between the several layers, beds, or strata, are found many remains of animals, and plants, particularly bones, shells, and ferns, sometimes in a Fossil state, sometimes in a Petrified (or Concrete) state, and consisting of an entirely concrete, or solid mass of stone.

The Terrene portion, or the Material substance and superficies of the terraqueous globe and planet, is, therefore, resolved and divided by the science of Natural Philosophy, *primarily*, into stratified, and unstratified Mineral bases. The Unstratified, or Chaotic, mineral bases are distinguished into—

1. *Fossil Earths* (such as may be dug), comprising all superficial layers of clay, sand, mud, and humus, or silt, common earth, gravel, and other soils, fit for gardens, agriculture, pasture, or fruit-trees.

2. *Concrete Earths and Stone*, comprising rocks, and mountains of basalt, granite, &c., disposed in irregular masses and ranges, or mountain Iula. The Stratified, or Plutonian mineral bases, are distinguished into Neptunoan, and Vulkanoan.

1. *Neptunoan Strata* are mineral products of Aqueous origin produced by the action of water, and disposed mostly beneath the surface of the Ocean ; the congeries of layers, or strata having been deposited in the Ocean, also congested and formed by the flux and tidal motions of the river and Ocean waters ; but some of the Neptunoan strata have (at successive periods of time) been raised above the level of the Ocean by the expansive force of internal heat during earthquakes, &c.

2. *Vulkanoan Strata* are mineral products of Igneous origin, and the production of Volcano fires and combustion, and they

comprise the upper, or superficial layer of new Mineral substance (*videlicet*, Concrete lava-stone, as well as Fossil cinder) now existing above; also of similar strata, of former ages, existing beneath the surface of the land.

The Stratified and Unstratified Mineral Bases, or constituent parts, Fossil and concrete, of the Material terrene substance of the terraqueous globe (and planet) have been classed by Mineralogists and Philosophers as primary, secondary, tertiary formations, according to the times and periods of the several successive formations of the strata, irregular layers, masses, ranges, or mountain iula.

Secondly. The stratified Mineral bases, or constituent parts of the Material superficies (and terrene portion) of the terraqueous globe and planet, have been also distinguished, resolved, defined, and named according to the relative nature and distinct properties of each kind of terrene substance, and also according to the specific and physical diversities of their several parts, portions, atoms, or particles, into—Salt formation, coal formation, gravel formation, slate formation, stone formation, sand formation, mud and humus, or silt formation, zoophite formation, or coral formation.

And finally, the Mineral formations have been distinguished as *supra* formations, *infra* formations, *de-montane*, *alluviale*, or *fluvatile*, &c. &c.

CHAPTER III.

I.—*Of Mineral Products, and the Mineral State of Nature.*

There exist about 50 several products, or distinct kinds of Material terrene substance, constituting the Mineral bases, as well as being the constituent parts of the terraqueous globe and planet.

Each Mineral product, or kind of Mineral substance (fossil-concrete, or solid), have been measured, weighed, analysed, discriminated, according to the laws of experimental philosophy, and according to the theory and doctrine of reality. But the relative nature, distinct properties, as well as the specific and physical diversities of their parts, portions, atoms, or particles, cannot be further numbered, or defined, resolved, or divided, separated, or diminished, distinguished, or perceived, by the sciences of Natural Philosophy, Experimental Philosophy, Mechanical Philosophy, or Mental Philosophy.

Mineral Products have a passive increase, and decay, or diminution of material substance, and mineral consistency; also of weight, or gravity in the assimilation, and dissolution of their several atoms, or particles; and they mingle, coalesce, and amalgamate in certain mathematical, chymical, or mechanical proportions, and quantities, as exemplified in Ice, the mixture of metals, as well as the petrification of vegetable and animal substances.

Mineral Products have been resolved and divided by Philosophers and Mineralogists into—1, Inflammables; 2, Salts; 3, Earths; 4, Metals.

1. *Salts, or Saline Mineral Products*, are acid to the taste, are easily dissolved in water, and, when dry, naturally return to the concrete material substance and angular shape of crystal.

2. *Inflammables, or Combustional Mineral Products*, dissolve only in oil, or fire; they are electrical, also readily ignited and burnt; consumed, or calcined—*videlicet*, sulphur, bitumen, coal.

All vegetable and animal substances are inflammable, or combustional.

3. *Earths*. The specific, and physical diversities of the parts, portions, atoms, or particles of every kind of terrene, or Material Mineral substance, cannot be singly particularised,

but described and defined comprehensively and Philosophically. Earths are not malleable, like the metals ; nor ductile, except clay ; nor are they, like saline and inflammable mineral products, soluble in water, or oil.

All earths can be broken into dust by mechanical force, or power ; and when the particles are mingled, and subjected to the intense heat of Fire, they amalgamate into a glassy, or vitreous substance.

Earths are discriminated, resolved, and divided scientifically and systematically into—

1. *Fossil and Rudimental Earths*. The essential and constituent parts, or particles of each material Fossil earth or Mineral product being separate, or coherent—*videlicet*, sand, clay, gravel, chalk, humus, and mud, or silt, common earth, &c.

2. *Concrete Earth, or Stone*. The essential and constituent parts, or particles of each concrete earth and stone, or mineral product, being congested into a solid mass, or stratum, having parallel layers, or laminae—*videlicet*, slate, sandstone, &c.

And likewise, agates, diamonds, and other precious stones and gems.

Or, otherwise, the Mineral structure and relative nature of the Concrete earth, or stone, is determined by the diversity of its angular outline, or other special, and distinctive property of the physical ingredients of its material substance—*videlicet*, crystal, conglomerate, granite, basalt, and other Concrete earth and stone.

Semi-Metals—*videlicet*, antimony, bismuth, zinc, arsenic, cobalt, &c.—are brittle, and are not malleable, and they are more, or less mixed with other substances. Mercury, or quicksilver is a fluid substance, or liquid mineral product.

4. *Metals* are the heaviest and most solid of all mineral products, or terrene material substances. Metals are melted by Fire ; they are also susceptible of superficial extension,

and of linear tenuity, by hammering, by pressure, and by tension.

There are seven chief Metals—*videlicet*, gold, silver, copper, tin, lead, iron, and platina.

Gold, silver, and copper, are the precious metals, for they regulate the value of all the other products of the terraqueous globe and planet.

II.—Of Vegetative Products, and of the Vegetative State of Nature.

Vegetative products, or plants are natural bodies of Creation, produced from seeds or multiform eggs, and partaking of an organical structure, and system of parts, portions, limbs, and members.

Vegetative products, or plants have a Material and Fluid increase or growth, also a Vitality, or vital instinct, and functions of sex, and propagation. The generative organs, or indices of Vegetative Vitality, as well as of the dual sex being produced in the flower and fruit, or flor-amental basis and receptacle of the fructification.

Vegetative products, or plants, are, Primarily, distinguished by the science of Natural Philosophy, as grasses, herbs, trees, and fruit-trees, or fructiferous plants (*Plantæ fructiferae*).

Vegetative products, or Plants, are also distinguished by the science of Experimental Philosophy, according to the structure of the Stem, into—1, Tubular and Arundinaceous plants; 2, Vascular and vesicular plants; 3, Fibrous and membranous plants.

I. *Tubular and Arundinaceous Plants* are those plants whose stems are tubular and arundinaceous; that is to say, the constitutional structure of the Stem is a hollow, or jointed cylinder, of a ligneous consistence and texture, or succulent and gramineous: the ligneous fibres, or succulent membranes,

and fabric of the vegetative tube, or cylinder, being disposed and arranged longitudinally, and perpendicularly.

II. *Vascular and Vesicular Plants* are those plants whose stems are expansive, and increase annually in circumference and Material substance; that is to say, the constitutional structure of the Stem is cellular, and of ligneous, or fibrous consistence and texture: the Material substance and fabric of the new annual vegetative layer, or "*vital indusium*"* of cells, follicles, and vesicles, being disposed and arranged around the Circumference of the Wood, or Ligneous Surface of the Stem, or Trunk of trees and fruit-trees, but covered and concealed by the exterior cortex or bark.

III. *Fibrous and Membranous Plants* are those plants whose Stems are fibrous, membranous, or pithy; that is to say, the constitutional structure of the stem and material substance of the plant consists of fibrous, succulent, or pithy membranes, disposed, arranged, or produced either longitudinally, or spirally around the central axis of the progressive motion and material increase of the Stem, whether perpendicular and erect, tortuous and twining, or procumbent and parallel with the superficial layer or surface of the soil—*videlicet*, the stem, or stipes of the Fungus, the stem of the *Banana palma*, the Fibrous stems of the hemp, hop, woodbine, bramble, and other plants.

The stems of fructiferous plants (*Plantæ fructiferæ*) are of miscellaneous vegetative structure and substance—*videlicet*, the strawberry plant, cucurbita vine, pineapple plant, the fig-tree, mango-tree, cherry-tree, elderberry-tree.

But there are many thousand species, and physical diversities of the different genera and kinds of plants, or vegetative

* "*Vital indusium*" is not my discovery, but is the intellectual fruit of the cranium of James Main, Esq., A.L.S., Author of *Illustrations of Vegetable Physiology*, second edition.

products, scattered and distributed over the regions of the terraqueous globe and planet, and adapted to the diverse localities of its superficies.

To acquire a perfect knowledge of plants, and of their vegetative properties, is to know the science of Botany; therefore, to acquire that knowledge, or science, by theory and doctrine, Botanists and Philosophers have arranged all known plants into a System of natural classes, resolved and divided into their proper genera, and kinds; also into the species, and varieties thereof drawn, or deduced, defined, and named:—

1st. From the primary phenonema of material substance and increase.

2nd. From constitutional circumstances of structure, and propagation.

3rd. From several distinctions of sex, or indices of vegetative vitality.

4th. From various modes of fructification, or production, envelopement, and support of the flower, fruit, and seeds, or vegetative ovum.

5th. From particular diversities of the constitutive parts of plants, or vegetative products; that is to say, into 11 natural Classes—*videlicet*,

1. Algæ—Multifrond and Marine Vegetative Products, or Sporigerent Plants.

2. Lichens—Superficial Products, or Sporigerent Vegetative Excrescences.

3. Fungi—Anomalous and Sporigerent Vegetative Products or Plants.

4. Musci, or Mosses—Multifrond and Diminutive, Cespitose and Creeping Plants, or Herbs.

5. Filices, or Ferns—Root-germinating and Frond-iul Amental, or Sporigerent Herbs.

6. Gramina or Grasses.

7. Herbæ, or Herbs—root-germinating and foliate, or frondeal Plants.

8. Bulbosæ, or Bulbous-stemmed and Palmated Herbs.

9. Palmæ, or Palmated Fruit-trees.

10. Arbores, or Forest-trees.

11. Fructiferous Plants (or Fruit-trees of the Orchard).

Many eminent botanists and philosophers have also arranged, resolved, and divided Vegetative products, or plants, into separate Classes, specified and named according to their natural phenonema and properties, as well as according to the physical diversities of the several parts—*videlicet*, 1. Gramina, or cespitose grasses: 2. Plantæ acaules; 3. Plantæ acalyces; 4. Apetalæ plantæ; 5. Coadunatæ; 6. Flosculosæ; 7. Monopetalæ; 8. Coniferæ; 9. Bacciferæ; 10. Pomaceæ; 11. Rosaceæ; 12. Cucurbitaceæ; 13. Liliaceæ; 14. Spathaceæ; 15. Amentaceæ; 16. Leguminosæ; 17. Siliquosæ; 18. Aphyllæ; 19. Scandentes; 20. Asperifoliæ; 21. Succulentes; 22. Orchideæ; 23. Ringentes, or Galeates; 24. Tricapsulares; 25. Verticillatæ; 26. Caryophyllæ; 27. Stellatæ, or Radiatæ; 28. Papilionatæ; 29. Umbellatæ; 30. Arundinaceæ; 31. Polyspermæ (many-seeded); 32. Gymnospermæ; 33. Compositæ, or Aggregatæ.

Vegetative products, or plants, are also arranged, according to the theory and doctrine of Linnæus, into a Sexual System of 24 Classes, resolved, divided, and named from several distinctions of Sex, or indices of vegetative vitality apparent in the flower and fruit, or flor-amental basis and receptacle of the fructification, the 24 Classes being subdivided into orders, genera, species, and varieties.

And lastly, Vegetative products, or plants, are arranged, according to the theory and doctrine of Bernard de Jussieu, into “a natural system,” that is to say, all plants, or vegetative products, are arranged, resolved, and divided into three great primary Divisions, *videlicet*,—

1. Acotyledones ; that is to say, plants, or vegetative products, budding or sprouting, and arising from the placenta and seed, destitute of seminal leaves.

2. Monocotyledones ; that is to say, plants, or vegetative products, budding or sprouting and arising with only one seminal or primary seed-leaf.

3. Dicotyledones ; that is to say, plants, or vegetative products, budding or sprouting and arising from the placenta and seed, with two, or more than two, seminal leaves.

The divisions of Jussieu are again resolved into classes, subdivisions, sections, and sub-classes, determined and distinguished from circumstances in the growth of the stem, and floral envelope, also in the insertion, and fasciculation of the stamina of the flower ; also in the placing of the petals, or floral leaves ; also in the disposition of the seeds, as well as of their receptacles, or cells ; and again subdivided into orders, genera, species, from the general organization of plants, and from the specific, and physical diversities of the several parts, or portions of plants, or vegetative products.

Vegetative products, or plants, have no spontaneous locomotion, nor mechanical power, but they derive their nourishment and increase and material substance from the diverse Fossil mineral layers, or soils of the material superficies of the terraqueous globe, by means of their roots, or organic radical membranes and Limbs. The aliment, or vegetative juice circulating through the stem of the plant is therein converted into various substances,—*videlicet*, wood, fibre, bark, hemp, cotton, gum, acids, fruits and seeds, oil ; also honey and wax, produced and fabricated by means of bees.

Of the various Modes of Fructification, or Production Envelopement and Support of the Flower, Fruit, and Seeds, or Multiform Vegetative Offspring.

1. The spor-iulum, or frond-iul amentum fructification; that is to say, when the kalyx, or flor-amental Basis and receptacle of the fructification, is frond-iul-amental, and sporigerent; or when the fruit, or seeds of the fructification are spores, or vegetative ova, supported upon the superficies, or surface of the leaves, membranes, or fibres of vegetative products, or plants, as apparent on the surface of the organic membranes or limbs, multifrond branches or leaves, teguments, tissue and fibrous filaments of the fuci (marine plants), lichens, fungi, ferns, and mosses.

2. The spika-iulum, or term-iul amentum-fructification; that is to say, when the kalyx, or flor-amental basis and receptacle of the fructification, is term-iul-amental, and occupies the terminal portion of the stem; or when the chaffy frumenta of the fructification are arranged in a spike, or regular series, around the terminal portion of the stem of vegetative products or plants—*videlicet*, the spike (or term-iul-amentum) fructification of the cereal gramina, or cespitose grasses of the field.

3. The Coronal Fructification, Gem Fructification, or Gem-iul-Amentum, Fructification; that is to say, when the Kalyx, or Flor-Amental Basis and receptacle of the Fructification, is Coronal and seated either Mono-gem and Single, on the Apex of the Flower Stem; or otherwise, the Gem-Amenta of the Fructification are many, and seated on the Apices of the Flower Stalks of the Stem, and constituting a chorus of Gem-Amental and Coronal Flowers and Amenta—*videlicet*, the Coronal and Mono-gem Kalyx and fructification of the Dandelion, also the Gem-iul-Amental and Coronal fructification of the Auricula and Cowslip.

4. The annular Fructification, or the whorl-iulum, cyclusiulum, gyr-iulum fructification—that is to say, when the calyx or flor-amental basis and receptacle of the fructification is verticillate, axillary, or cyclear, or when the flowers and amenta of the fructification are produced and supported, either—*First*, in whorls around the stem of the plant or vegetative product; *videlicet*, the flowers and amenta of mint, thyme, savory, groundivy, &c.—*Secondly*, or otherwise when the flowers and amenta of the fructification are produced and supported at the joints, or axels of the branch and stem; *videlicet*, the axillary flowers and pod-amenta of the pea, bean, vetch, trefoil, &c.—*Thirdly*, or when the flowers and amenta of the fructification are cyclear, and produced and supported around all other portions of the stem in diverse Cycles or Series.

5. The chorymbal fructification, spadix, or spatha-iulum fructification; that is to say, when the calyx or flor-amental basis and receptacle of the fructification is chorymbal, and the flowers and amenta come forth from a sheath, or spatha; *videlicet*, the spadix, or chorymbal flower and fruit Stalk, or iulum of the palmated fruit-trees.

The chorymbal mode of fructification is either capitular, and at the top of the stem, as exemplified in the palmated fruit-trees; or otherwise the flowers emerge from some other part or portion of the plant—*videlicet*, the racemus of the uva, or grape-vine, and the racemus of the currant-tree.

6. The Kett-Kens, Kat-iulum, or teg-ul-amentum Fructification; that is to say; when the Kalyx, or Flor-amental basis and receptacle of the fructification is teg-ul-amental; and comprises a series of Flowers and Amenta, imbricated and arranged around an Axis, or Iulum consisting of a Fibrous Stalk dependent from the boughs of many trees and herbs—*videlicet*, the Kett-Kens, Kat-iula, or teg-ul-amental Fructification of the Willow-tree, Fir-tree, Hop-vine, Birch-tree, Hazle fruit-tree.

Of the several constitutive Parts, Portions, Limbs, Filaments, Fibres, and organic Members of Plants or Vegetative Products.

The organic members, limbs, constitutional parts, and portions of vegetable products or plants are—

1. *The Seed*, or multiform vegetative egg, the primary organic member of the vegetative state of nature, and containing the germ of Vitality, and axis of vegetative motion.

2. *The Placenta*, comprehending the vegetative womb, also the basis of the plant and stem, as well as the place of the germination of the root, or roots.

3. *The Root, or Roots*, constituting the subterranean parts, or portions of the plant, or vegetative product, and consisting of several fibrous, or ligneous membranes, limbs, and organic portions, or products, proceeding from the placenta, or vegetative womb, and divergent from the basis of the plant; *videlicet*, the Roots, or fibrous radical membranes of the cereal gramina, or cespitose, and arundinaceous grasses of the field, also, the ligneous roots, or radical limbs of most trees and fruit-trees.—*Secondly*, or otherwise the Root consists of only one organic limb; *videlicet*, the caudex, or stock-root of the turnip, carrot, rhubarb, and other garden herbs.—*Thirdly*, or otherwise the Root or roots consist of several organic radical portions (or vegetative products), distinct and separate from the annual stem, and from the placenta and basis of the plant; *videlicet*, the radical caudices, tubers, knobs, or stock-roots of the potato herb—a species of the solanum genus of plant.

4. *The Stem*, either annual or permanent.

5. *The Bud*.

6. *The Branch, Bough, or divergent and Organic Limb*.

7. *The Leaves or Green Membranes*, either radical or stemmal.

8. *The Kalyx*, or Flor-Amental Basis, receptacle and support of the Fructification, comprehending—*First*, the Basis or Iulum—*Secondly*, the Flower, or Flos—*Thirdly*, the Amentum, or Seed-vessel.

9. *The Cortex*, or Bark, or superficial Organic Vegetative Layer, covering the Wood or Ligneous substance of the tree and fruit-tree.

10. *The Wood*, or Material Ligneous substance of the tree and fruit-tree.

11. *The Pith*, Fibre, Cane—Internal Membranous substances of the Plant or Vegetative Product.

12. *The Sap*, or Vegetative Juice.

Of the several kinds of Bud.

There are four distinct buds, or separate organic members of vegetative propagation and increase, *videlicet*—

1. *The Seed Bud*, proceeding from the seed, ovum, or vegetative egg, annually disseminated, and planted in the soil, or superficial layer of the material mineral substance (or terrene portion) of the terraqueous globe and planet.

2. *The Germ Bud*, proceeding from the placentum of the permanent root, or otherwise from the placentum of the organic bulb (or round membranous stirpal), and constitutive portion of the annual vegetative stem, or otherwise from the placenta of organic radical products, members, or limbs, separate and distinct from the annual stem, but connected by means of fibrous roots, or radical petioles.

3. *The Leaf Bud*, proceeding from the inner corticle, or membranous integument of the annual stem of the cespitose and arundinaceous grasses and herbs; also from the annual "*vital indusium*" of the ligneous stem of trees and fruit-trees.

4. *The Gemma, or Flower Bud*, or bud of the fructification.

Of the several kinds of Stem

Hitherto discovered and defined by Botanists and Philosophers.

1. *The Stipes*, or stem of the fungi, as the stipes, or stem of the mushroom.

2. *The Scapus*, or flower-stem, as the scape, or tubular flower-stem of the dandelion, the scape or fibrous stem of the daisy, the scapus or stem of the auricula and cowslip.

3. *The Culmus*, or jointed stem, as the culm, or jointed stem of the cereal gramina, or cespitose grasses of the field (or arundinaceous plants).

4. *The Truncus*, or ligneous stem of trees and fruit-trees, comprehending the ligneous stem, or trunk of the oak-tree, poplar-tree, fir-tree, yew-tree, elderberry-tree, &c., as well as the columnar stem or trunk of the arboreal palmæ, or palmated fruit-trees.

5. *The Caulis*, or fibrous and membranous stem of many garden herbs; *videlicet*, the Caul, or stock-stem of the cabbage (Brassica), carrot, lettuce, turnip.

6. *The Vitis*, or tortuous, twining, or climbing Stem; *videlicet*, the twining or tortuous stem of the grape (uva) and other vines, as the Stems of the hop-vine, pepper-vine, jessamine-vine, ivy-vine, &c. woodbine, &c.

7. *The Bulb*, bulbous Stem, or bulbous portion of the stem.

Of the Cortex or Bark,

The several parts, or portions of the cortex or bark are—

1. *The Subereum-Suberind*, or outer tegument and exterior layer of the cortex, or bark.

2. *The Liber*, inner rind, or integument, and interior layer of the cortex, or bark.

3. *The "Vital Indusium"*—annual vegetative membrane, or vital membrane of the ligneous vegetative product, or plant.

Of the Branches, Boughs, and Organical Limbs, divergent from the Stem.

1. *The Ligneous Boughs, or branches* of the tree, as the ligneous boughs or branches (and deciduous leaf) of the oak-tree, poplar-tree, larch-tree, apple-tree, grape-vine, elder-berry-tree, &c.; as well as the ligneous bough, or branch (and evergreen leaf) of the yew-tree, holly-tree, laurel-tree, myrtle-tree, &c.

2. *The Palmated Boughs, or frondeal* and terminal branches of the palmæ, or palmated fruit-trees—*videlicet*, the membranous boughs and frondeal branches of the banana and sago palmæ; also the multifrond boughs, or branches of the date and cocoa-nut palmæ, or palmated fruit-trees.

3. *The Turiones, or Caprioles*, that is to say, the tendrils, or curled limbs of vines, or twining and climbing plants, or vegetative products.

4. *The Spines, the Thorns, the Prickles, the fibrous Filaments*, emanant either from the wood, ligneous substance, and fabric of the plant, or otherwise from the “*leaves, fronds, bark, rind, husk, and other “external membranes” and “teguments”* of the grass, herb, tree, or “*fruit tree.*”

5. *The Petiolus, Stalk, or Stalks*, divergent and fibrous limbs, joints, or filaments, supporting the leaf or leaves of the stem and branches, as well as the flowers and fruits of the fructification—*videlicet*, the stalks of rose-buds, the flower and pod stalks of the pea-vine, the flower and fruit stalks of the cherry and apple trees, the flower and fruit stalks of the cucurbita vine, the flower and fruit stalks of the haw.

6. *The Bulbus and Bulbulets*, the organic portion of the stem, and divergent portions from the stem.

Of the Fructification, or Production, Envelopement, and Support of the Flower, Fruit, and Seeds, or Multiform Vegetative Offspring.

The Fructification of Vegetative Products, or Plants partakes of a Dual Process.

The Organic Members and Constitutive parts, or Portions of the Kalyx, or Flor-Amental Basis, Receptacle, and support of the Fructification, are—

1. *The Basis, or Iulum*, a vegetative Membrane of a Discous Structure, supporting the Flor-Amental parts, or Portions of the Fructification.

2. *The Amentum, or Seed-vessel.*

3. *The Flower, or Flos.*

4. *The Peri-Flori-Anth*, an annual Membrane, encircling the Floral Basis or Basements, as well as the Anthos, or internal portion of the Flower and Fructification.

The Peri-flori-Anth is constructed mostly of the same substance and texture as the Membranous Corticle, or tegument of the plant, whether grass, herb, tree, or fruit-tree.

Of the several Parts of the Flower, or Flos.

The several parts of the Flower or Flos are—

1. *The Disk, or Iulum* of the Flower, or chorus of Flowers, and supporting the Cymar, and Anthos.

2. *The Cymar*, a multiform membrane, or Web of many diverse colours, protecting and surrounding, either completely or partially, the Stamina and Pistilla, or Indices of Vegetative Vitality.

The Cymar is either entire, or consists of several parts, or separate portions, but of the same texture and substance as the "*Vital Indusium*," or Annual Membrane, covering the Ligneous Surface of the Stem.

3. *The Anthos, or Anth*, consisting—*First*, of the *Collet*, or Interior Coronal Portion of the Disk and Basis of the Flower and Fruit Stem, or of the Disks and Basements of the Flower and Fruit Stalks.—*Secondly*, of the *Stamen and Pistillum*, or Stamina and Pistilla emanant from the Collet, or Interior Coronal Portion of the Floral Basis, or Basements. The Stamina and Pistilla are the Central Filaments of the Flower, also the organic Members (or Membranes) of the Generation and propagation of Plants or Vegetative Products.

Of the Cymar, and Floral Membrane, or Coloured Web of the Flower.

The cymar is either entire, or partite; the parts or portions of the entire mono-frond cymar are—

1. *The Tuba*, or cylindrical portion of the cymar.
2. *The Corolla*, or circular border and expanded portion of the coloured web or membrane; as exemplified in the convolulus.

As to structure, the particular diversities of the Cymar, Floral web, or membrane are—*First*, the *bell form*; *Second*, the *tuba form*; *Third*, the *funnel form*.

The parts or portions of the *partite*, or *divided cymar*, are the wings, hoods, veils, petals or leaves, fronds, lappets, filaments, and fibres.

The chief diversities of the *partite*, or *divided Cymar* are—

1. From the peculiar form and appearance of the Webs or Fronds—*videlicet*,—
1. *Winged*, as the Wings, or Fronds of the Pea-Flower.
2. *Hooded*, as the Hooded Fronds of Aconite-flower, or Monk's Hood.
3. *Gaping*, as the divergent fronds of the Flower named Dragon's Mouth.

The Partite Cymar is also distinguished by the number of Petals, or Floral Leaves—*videlicet*, *tripetalous*, or tri-partite;

quadri-partite, or tetra-petalous; quinque-partite, or quinque-petalous. Also, multi-petalous, multi-filamentous; multifrond, or multi-partite.

Of the Amentum, or Seed Vessel.

The parts of the Amentum, or fructiferous portion of the Kalyx are—

1. *The Basis, Disk, or Iulum*, supporting the Fruit, Seeds, or Vegetative Ovum.

2. *The Loculamenta*, or cells containing the Seeds.

3. The External *Pulp*, or Internal *Pulp*, *Pome*, juice, pith, Cotton, Frumental Seeds, and other portions of the Cereal, or Harvest, and Garden Fruits.

5. *The Husk*, or exterior tegument of the Fruit or Seed.

The remarkable diversities of the Amentum, Seed-vessel, or Receptacle of the Seed, and Multiform Vegetative Offspring, are,—

1. *The Pome-Amentum*, consisting of the External Pome, and the Internal Membranous Cells; containing the Seeds of the Plant—*videlicet*, of the Apple, Pear, Haw, Rose, &c.

2. The Mor-Amentum—*videlicet*, the Morum, or Pulpy receptacle and Seed-vessel of the Mulberry, Raspberry, Strawberry, Blackberry.

3. The Bacca-Amentum—consisting of the External Pulp, and the internal Stony Shell, enclosing the Seed, or Ovum of the Cherry, Plum, Peach, Mango, trees, &c.

4. The Drupa-Amentum, ditto of the oval olive.

5. The nucamentum—Shell, or hard oviform membrane and receptacle, enclosing the internal pome and seed of the filbert, cocoa-nut, &c.

6. The uva-amentum—*videlicet*, the juicy receptacle of the grape, currant, gooseberry, seeds.

7. The frumentum or frumenta—*videlicet*, the husky or chaffy amenta, and receptacles of the seeds of the cereal gramina, or cespitose grasses of the field.

8. The volva-amentum of the fungi.

9. Thestrobil-amentum, or amenta—*videlicet*, the hard corticate amenta, and receptacles of the seeds or ova, of the fir-tree.

10. The pod-amentum, as the pod (amentum) of the pea bean, lupin, trefoil, chestnut, beech, &c.

Other distinctive varieties are the legume, also the capsule, also the siliqua, and follicul-amenta, &c. &c.

III.—Of *Animate Products*, and of the *Animate State of Nature*.

Animals are natural bodies of the terraqueous globe and planet. They are created and made of the material and fluid substances of earth, and water, and they have an organical structure and dual sex.

Animate products, or animals are male and female; they are endowed with the breath of life, sensation, and mechanical power; and they also have locomotive, or migrational functions and faculties.

Animals are Primarily resolved and divided by the science of Natural Philosophy into seven classes, *videlicet*,—1 *Mankind*, or the *Humanus* class; 2. *Bestia*, or the *Quadrupes* class; 3. *Reptilis*, or *Amphibios* class; 4. *Piscis*, or *Pinnata* class; 5. *Vermis*, or *Serpens* class; 6. *Insecta*, or *Bi-natalis* class; 7. *Avis*, or *Plumata* class.

The vermis, or serpens class, are without feet, or fins.

Animals, and the diverse genera and species of animals, are distinguished from each other by their different habits of life, as well as by peculiarities in the conformation of the parts of the body: the structure of their bodies being organized with diverse locomotive and mechanical functions; and the consti-

tutive parts, limbs, members, and organs, being created and composed of different animal substances adapted to their different modes of life.

Animals mostly subsist upon the vegetative products of the earth, but they likewise eat one another.

Animal substances are oil, horn, ivory, skin, fur, hair, feathers, wool, silk, shells, bone, flesh, fat.

The parts, portions, limbs, members, and organs of animate products, or bodies, are the trunk, or carcass, the head, the arms and hands, the legs and feet, the mammæ, or paps, the belly, the womb, the wings, the feathers, the tail, the claws, or talons, the proboscis, the beak or bill, the teeth, the horns, the nails of the hand, the feelers or antennæ, the mane, the hump, the crest, the hairs, scales, fins, toes, fingers, &c.

The exterior and interior mechanical organs of the animal body and system are—*First, The Organs of the Brain, or Cerebral Viscera and Cranium*, a collection of organs, consisting of fibrous and vascular membranes and chords, disposed and arranged in the skull or head, *videlicet*—the nose or organs of breath and smell; 2. the eyes, or organs of sight; 3. the ears, or organs of hearing; 4. the mouth, or organs of food and speech and taste; 5. the nerves, or organs of sensation, extending from the brain to every part of the head, body, and limbs.

The nerves are essentially necessary to muscular motion; and they are concealed under the superficial and exterior tegument of the skin or hide, feathers, and hair; or otherwise, within or underneath testudinate shells and scales, covering the bodies of many animals.

Secondly. The interior mathematical organs of the animal body and system (or animate state of nature) are the organs of the *Pulmo, or Thoracic Viscera of the Breast and Ribs*,—*videlicet*, the collection of organs, membranes, and fibres of a

muscular, glandular, and cellular texture and fabric, adapted for respiration, and the continuance of the motion and circulation of the breath, fluid blood, and aliment, or food, *videlicet*, 1, The *trachea*, or *wind-pipe*; 2, The *lungs*; 3, The *heart and pericardium*; 4, The *pleura*.

Thirdly. The interior and chymical organs of the animal body and system, or animate state of nature, are the organs of the *belly and womb*, or *abdominal and uterine viscera*; otherwise, the collection of organs, membranes, and ducts, adapted for the birth and reception and envelopement of the offspring or child; also for the digestion, separation, and distribution of material and liquid food throughout all parts of the body and limbs, by means of the veins and arteries, *videlicet*—1, The *womb*; 2, The *liver*; 3, The *gall*; 4, The *spleen*; 5, The *kidneys*; 6, The *bladder*; 7, The *stomach*; 8. The *gut*.

The connecting parts, portions, and organic members of the animal body and system (or animate state of nature), are—1, The *trachea*, or *windpipe*, connecting the organs of respiration and circulation; 3, The *muscles and sinews*, also the *cartilages and ligaments* connecting the bones, flesh, the nerves, and the mechanical and locomotive membranes; 4, The *nerves*, or *organs of sensation*; 5, The *male and female organs of generation*; 6, The *veins and arteries*; 7, The *alimentary duct or canal*; 8, The *secretory glands*, viz., the digestive, *salival, sebaceous, lubricatory, &c.*; 9, The *mammæ, paps*, or organs of nutrition; 10, The *navel and umbilical chord*, supporting the foetus or embryo offspring within the womb; 11, The *ovum*, animal egg, or oviform embryo or offspring; the exterior and superficial covering or tegument of the egg consisting of mineral earth; 12, The *membranous follicles and other teguments*—*videlicet*, the *periosteum*, or membrane covering the bones; the *peritoneum*, enveloping the bowels; the *pericranium*, spreading over the skull; the *pericardium*, or membrane around the

heart; the *glandular cuticles*, wrapping the glands; also the *hide, or external skin*, covering the entire body, and concealing the nerves or organs of sensation.

Other distinct organic portions of the animal body and system (or animate state of nature) are, the foot, the wing, the fin, or organs of locomotion and migration; also the hand, or organ of human art.

Of the Phenomena, Mechanical Powers, and Diverse Construction of Animate Products, or Animals.

When we are instructed by philosophy to consider the locomotive and migrational actions and powers of animals, and to discover the unlimited variety of organical structure, mechanical movement, and sensation diversified in the system of animate creation and production, we behold displayed the infinite power of the Almighty Creator.

1. From the strong and intelligent elephant, that pulls up the trees of the forest, and is able to pick up a pin, to the ape, resembling man in all animal functions, but not in mental.

2. From the blind worm, without bones, that moves through the ground, to the scaly fish that swims in the waters, and cannot live out of the water.

3. From the eagle and vulture, directed by vision and scent to their distant and remote prey with certainty, to the owl and the bat, who are torpid and blind during the day, but have the faculty of vision during the night-time.

4. From the serpent, in whose tooth there is poison, and who walks and swims without feet, or fins, to the horned land-snail of the garden, created with one shell, and to the marine snail, sticking to the rock of the deep sea, created with two shells.

5. From the melodious nightingale, that warbles during the night-time, to the peacock that spreads his beautiful plumage in the sunshine.

6. From the long-living tortoise, crawling on four feet, her shell fastened to her back, to the silk-worm, who spins around him a covering of gold-coloured fleece to dwell in, and whose animal existence becomes changed thrice.

7. From the lazy and gluttonous sloth to the industrious and republican ants.

8. From the oily whales that swim and live in the waters of the ocean, and suckle their offspring with milk, to the piscivorous and gregarious seals, who congregate in herds upon the shores and ice of the arctic ocean, but are web-footed and subsist in its waters.

9. From the amphibious crocodile, who battles with the tiger, to the house lizard, who walks with his feet to the ceiling, and devours the fly.

10. From the lone spider, who fabricates a geometrical net, or web of glutinous texture and substance, from her own intestines, and whose nuptial bower is air surrounded with water, to the politic bees, who always construct the cells of their hive mathematically, and who have diversities of sex in like manner as plants, or vegetative products.

11. From the swift-footed ostrich of the sandy desert, that swallows stones, to the swallows who build their houses of mud, and who travel over half the terraqueous globe and planet without resting.